

SKILLS INTRODUCTION**Drawing Conclusions**

Suppose that you have a portable radio with headphones. One day you turn the radio on, but you don't hear your favorite station. You try other stations and still get no sound. You think that the batteries must be dead, so you put in new ones. Still there is no sound. You try replacing your headphones with ones from your sister's radio. Your favorite music is back! You draw the conclusion that there was something wrong with your headphones.

In everyday language, the word "conclusion" means an explanation or interpretation of an observation or a statement. In science, the word "conclusion" usually has a more limited meaning. **Drawing a conclusion** means making a statement summing up what you have learned from an experiment.

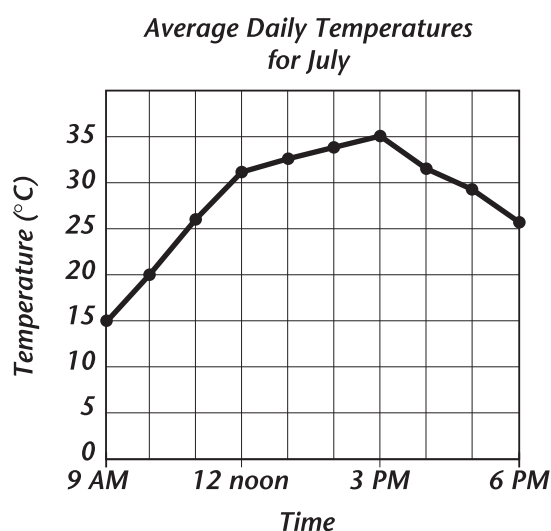
The conclusion of an experiment is usually related to the hypothesis. You may recall that a hypothesis is an *If . . . then . . .* prediction made about the outcome of an experiment. After you have carried out the procedure, made and recorded observations, and interpreted the data, you can finally determine whether your experiment showed your hypothesis to be true or false.

Suppose that Leon and Jobelle each write a hypothesis about the summer temperatures where they live.

Example 1: Leon writes, *If I measure the temperature on sunny summer days in this location, then the warmest air temperatures will occur between 11 A.M. and 1 P.M.*

Example 2 Jobelle writes, *If the day is sunny, then the hottest time of the day will be about 3 o'clock in the afternoon.*

They then test their hypotheses by measuring the outdoor temperature several times a day for the month of July. Then they average their data and graph the data as shown at the right.



Drawing Conclusions *(continued)*

From the graph, Leon can see that the results of the investigation do not support his hypothesis. He draws this conclusion: *Based on a study of temperatures between 9A.M. and 6P.M. on sunny days, the warmest temperatures do not occur between 11A.M. and 1P.M. but happen sometime later in the afternoon.*

The results do support Jobelle's hypothesis, however. She draws the following conclusion: *On sunny days in July, the warmest temperatures occur about 3P.M.*

Before scientists become confident of their conclusions, they often repeat their experiments many times and compare their work with that of others. Additional experiments may provide further support for a particular hypothesis. Alternatively, they may cause a researcher to revise or replace the hypothesis.



Tips for Drawing Conclusions

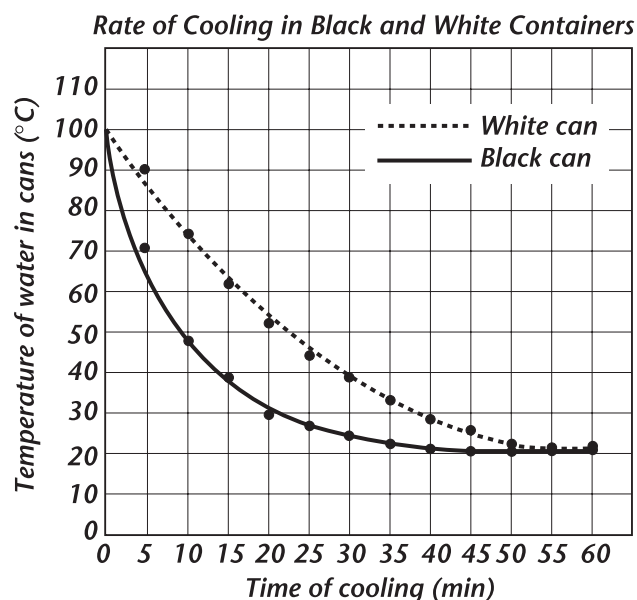
- ◆ Refer to the hypothesis for your experiment.
 - ◆ Review the observations in your experiment. Analyze the data, completing whatever calculations or graphs will help you identify trends or patterns in your results.
 - ◆ Determine whether your data support your hypothesis or suggest that it is false. Write a statement summing up what your results show.
 - ◆ Consider whether you might plan other experiments to support your conclusion or compare your work with that done by other researchers.
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✓ **Checkpoint** Do you think Jobelle can use the data to draw a conclusion about daily temperature changes that occur at other times of the year? Explain.

SKILLS PRACTICE**Drawing Conclusions**

Answer the questions below on the back of this page or on a separate sheet of paper.

Olena and Bruce are studying whether the color of a container affects how fast the container cools down. Olena wrote this hypothesis: *If you put hot water in white and black cans, the cans will cool down at the same rate.* Bruce wrote this hypothesis: *If hot water is put in black and white cans, the black can will cool down faster than the white can.* They then tested their hypotheses. Here is their graph.



1. Examine the data presented in the graph. Notice the temperatures of the black and white cans at the times the measurements were taken. What does this data tell you about the way the two cans cooled down?
2. Compare the evidence in the graph with Olena's hypothesis. What conclusion should Olena draw?
3. Compare the evidence in the graph with Bruce's hypothesis. What conclusion should Bruce draw?
4. Neither Bruce or Olena included anything about the cans' final temperatures in their hypotheses. Rewrite one of their conclusions to include information about the final temperatures of the cans.
5. **Think About It** Who do you think learned more about temperature changes: Bruce or Olena? Does it make any difference if one person's hypothesis was shown to be false? Explain.